

REMARKS

Claims 1-37 are pending. Claims 1, 11, 21, 22, 23 and 35 and the specification have been amended for clarity. Reconsideration and allowance of the present application based on the above amendments and the following remarks are respectfully requested.

The Office Action Summary (PTO-326) and page 2, paragraph 1 of the Office Action indicate that none of Applicants' certified copies of the priority documents have been received. Enclosed is Applicants' September 1, 2000 date-stamped post card receipt clearly acknowledging receipt of Applicants' two priority documents. Also enclosed are copies of the first two pages of each priority document. Acknowledgement of Applicants' claim for priority and the priority documents filed in support thereof are respectfully requested.

Improper Rejections

Independent claim 11 was rejected under 35 U.S.C. §103 (a) over Soules et al. in view of Hampden-Smith et al. or Soules et al. in view of Shimoyama et al. and further in view of Hampden-Smith et al. Dependent claim 36, which includes all the features of claim 11, was rejected under 35 U.S.C. §102 (e) over Soules et al. or, in the alternative under 35 U.S.C. §103 (a) over Soules et al. in view of Shimoyama et al.

The rejection of claim 36 fails to establish a *prima facie* case of anticipation or obviousness as it fails to include the features allegedly disclosed or suggested by Hampden-Smith et al., which features were relied upon in rejecting base independent claim 11. The rejection of claim 36 is thus improper and must be withdrawn. In addition, as Applicants have not amended claim 36, any new ground of rejection against claim 36 will not be necessitated by Applicants' response and must be non-final.

Similarly, claim 37 was rejected under 35 U.S.C. §103 (a) over Soules et al. in view of Thompson et al. or Soules et al. in view of Shimoyama et al. and further in view of Thompson et al. This rejection also fails to establish a *prima facie* case of obviousness as it lacks the features allegedly disclosed or suggested by Hampden-Smith which were relied upon in rejecting base independent claim 11. Withdrawal of the rejection is respectfully requested.

Independent claim 21 was rejected under 35 U.S.C. §103 (a) over Soules et al. in view of Thompson et al. or Soules et al. in view of Shimoyama et al. and further in view of Thompson et al. The rejection of claims 23 and 24 under 35 U.S.C. §102 (e) over Soules et

al. or under 35 U.S.C. §103 (a) over Soules et al. in view of Shimoyama et al. fails to establish a *prima facie* case of either anticipation or obviousness as the rejection does not include the features allegedly disclosed or suggested by Thompson et al. relied upon to reject base independent claim 21. Claim 23 has been rewritten in independent form only and any new ground of rejection entered against it would not be necessitated by Applicants' amendment and must be non-final.

changes
scope

Applicants have amended Figure 7 to correct informalities discovered therein. Please see the attached Drawing Change Authorization Request for changes made to Figure 7.

The Office Action objected to the specification and claims 22, 23, 35 and 37 for various informalities. Applicants have amended the specification, e.g., on pages 3, 6 and 14 thereof, to correct the informalities indicated in the Office Action. Applicants have also cancelled claim 37 and amended claims 22, 23 and 35 to correct the informalities indicated in the Office Action.

Section 112 Rejections, first and second paragraphs

Claims 23, 24, 36 and 37 were rejected under 35 U.S.C. §112, first paragraph. The cancellation of claim 37 renders this rejection moot with respect to claim 37. Applicants traverse this rejection with respect to claims 23, 24 and 36 because the subject matter recited in those claims is supported in the specification. Claims 23 and 24 were originally disclosed, and thus supported in the specification. The Examiner's attention is directed to page 15, line 15 to page 16, line 22 of the specification for an example of support for the claimed subject matter recited in claims 23, 24 and 36.

Claims 12-20, 21-34 and 37 were rejected under 35 U.S.C. §112, second paragraph. The cancellation of claim 37 renders this rejection moot with respect to claim 37. Claims 11, 21 and 22 have been amended in accordance with the suggestion of the Office Action. In particular, claim 22 has been amended to recite elements that emit green light as described in the specification at page 14, lines 4-12. With respect to claims 23 and 24, the Examiner's attention is directed to page 15, line 15 to page 16, line 22 of the specification for a description of the claimed subject matter recited in claims 23 and 24. Accordingly, Applicants respectfully request the withdrawal of the rejection with respect to claims 11, 21, 22, 23 and 24.

Prior Art Rejections

Claims 1-3, 8, 10, 23, 24 and 36 were rejected under 35 U.S.C. §102 (e) over Soules et al. (U.S. Patent No. 6,252,254; hereafter "Soules"). The rejection is respectfully traversed.

Independent claims 1 and 23 each recite a light-emitting apparatus comprising, among other elements, a primary light source including a GaN semiconductor light-emitting device, a secondary light source including a fluorescent material and a third light source configured to emit red light. Claim 1 further recites that the GaN semiconductor light-emitting device comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction, wherein the light-emitting layer is positioned a first distance from the substrate and the reflection layer is positioned a second distance from the substrate and wherein the second distance is less than the first distance so that the reflection layer is positioned closer to the substrate than the light-emitting layer. Independent claims 11 and 21 also recite a primary light source including a GaN semiconductor light-emitting device.

Soules discloses a light-emitting device, such as a light-emitting device (LED) or a laser diode (LD). Soules's device has a blue LED covered with a phosphor-containing layer. Blue light emitted from the blue LED is used to excite one blue-excited phosphor for emitting red light and one blue-excited phosphor for emitting green light. However, Soules does not disclose a primary light source including a GaN semiconductor light-emitting device.

Moreover, Soules does not disclose a GaN semiconductor light-emitting device that comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction, wherein the light-emitting layer and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

Therefore, Soules fails to disclose a semiconductor light-emitting apparatus having the structure recited in independent claim 1.

Claims 2-3, 8, 10 and 24 depend from one of independent claims 1 and 23 and are patentable by virtue of their dependence on independent claims 1 and 23, in addition to their recitation of additional patentable subject matter.

Further, independent claim 11 recites a GaN semiconductor light-emitting device that comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction, wherein the light-emitting layer

and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

Claim 36 depends from independent claim 11, which further recites a secondary light source including a first fluorescent material composed of at least one member selected from the group consisting of ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce. Soules neither discloses the GaN semiconductor light-emitting device nor the claimed fluorescent material, as recited in independent claim 11. Therefore, claim 36 is patentable by virtue of its dependence on independent claim 11, in addition to its recitation of additional patentable subject matter.

Withdrawal of the rejection of independent claim 1 (and its dependent claims 2-3, 8 and 10), independent claim 23 (and its dependent claim 24) and dependent claim 36 (which depends from independent claim 11) is respectfully requested.

Claims 1-3, 8, 10, 23, 24 and 36 were rejected under 35 U.S.C. §103 (a) over Soules et al. (U.S. Patent No. 6,252,254; hereafter "Soules") in view of Shimoyama et al. (U.S. Patent No. 5,804,834; hereafter "Shimoyama"). The rejection is respectfully traversed.

For at least the reasons set forth above, Soules fails to disclose a first or primary light source including a GaN semiconductor light-emitting device, wherein the GaN semiconductor light-emitting device comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction and wherein the light-emitting layer and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer, as recited in independent claim 1. However, the Office Action relies on Shimoyama for its disclosure of a distributed Bragg reflector (DBR).

Shimoyama does not remedy the deficiencies of Soules with respect to independent claim 1 because Shimoyama merely teaches a distributed Bragg reflector positioned above or under the light emitting layer. In contrast to the claimed light-emitting apparatus, the distributed Bragg reflector of Shimoyama is not part of a GaN semiconductor light-emitting device. Further, Shimoyama is not concerned with positioning the distributed Bragg reflector closer to the substrate than to the light-emitting layer, as recited in independent claim 1.

Accordingly, the combination of Soules and Shimoyama fails to yield the claimed invention, as recited in independent claim 1.

Claims 2-3, 8 and 10 depend from independent claim 1 and are patentable by virtue of their dependence on independent claim 1, in addition to their recitation of additional patentable subject matter.

Further, each independent claim 11 and 21 recites a GaN semiconductor light-emitting device that comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction, wherein the light-emitting layer and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

Claim 36 depends from independent claim 11, which further recites a secondary light source including a first fluorescent material composed of at least one member selected from the group consisting of ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce. The combination of Soules and Shimoyama neither teaches the GaN semiconductor light-emitting device nor the claimed fluorescent material, as recited in independent claim 11. Therefore, claim 36 is patentable by virtue of its dependence on independent claim 11, in addition to its recitation of additional patentable subject matter.

Withdrawal of the rejection of independent claim 1 (and its dependent claims 2-3, 8 and 10), independent claim 23 (and its dependent claim 24) and dependent claim 36 (which depends from independent claim 11) is respectfully requested.

Claims 4-7 and 9 were rejected under 35 U.S.C. §103 (a) over Soules or Soules and Shimoyama in view of Butterworth et al. (U.S. Patent No. 5,847,507; hereafter "Butterworth"). The rejection is respectfully traversed.

Butterworth merely discloses a light source comprising a light emitter to emit light of a first wavelength and a lens to focus the light emitted from the light source. The lens includes a fluorescent material to absorb light of the first wavelength and re-emit light of a second wavelength. Butterworth fails to disclose a semiconductor light-emitting device having the structure recited in independent claim 1 and does not remedy the deficiencies of Soules and Soules and Shimoyama with respect to independent claim 1.

Accordingly, neither Soules, Shimoyama nor Butterworth, whether considered individually or in combination, disclose, teach or suggest a semiconductor light-emitting apparatus having the structure recited in independent claim 1.

Claims 4-7 and 9 depend from independent claim 1 and are patentable by virtue of their dependence on independent claim 1, in addition to their recitation of additional patentable subject matter.

Withdrawal of the rejection of dependent claims 4-7 and 9 is respectfully requested.

Claims 11-13, 18, 20 and 35 were rejected under 35 U.S.C. §103 (a) over Soules or Soules and Shimoyama in view of Hampden-Smith et al. (U.S. Patent No. 6,153,123; hereafter "Hampden-Smith"). The rejection is respectfully traversed.

Independent claims 11 and 35 each recite a light-emitting apparatus comprising, among other elements, a primary light source including a GaN semiconductor light-emitting device. Claim 11 further recites that the GaN semiconductor light-emitting device comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction and wherein the light-emitting layer and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer. Furthermore, claim 11 recites a secondary light source including a first fluorescent material composed of at least one member selected from the group consisting of ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce.

For at least the reasons set forth above Soules and Soules and Shimoyama do not disclose, teach or suggest a primary light source including a GaN semiconductor light-emitting device, as recited in independent claims 11 and 35.

Hampden-Smith does not relate to a light-emitting apparatus or to a light-emitting apparatus including the claimed GaN semiconductor light-emitting device. Thus, Hampden-Smith does not remedy the deficiencies of Soules and Shimoyama noted above with respect to claims 11 and 35.

Accordingly, the combination of Soules and Hampden-Smith or the combination of Soules, Shimoyama and Hampden-Smith fails to yield the claimed invention.

Applicants respectfully request that the rejection of independent claim 11 (and its dependent claims 12-13, 18 and 20) and independent claim 35 be withdrawn.

Claims 14-17 and 19 were rejected under 35 U.S.C. §103 (a) over Soules and Hampden-Smith or Soules, Shimoyama and Hampden-Smith in view of Butterworth. The rejection is respectfully traversed.

For at least the reasons set forth above with respect to independent claim 11, neither Soules, Shimoyama, Butterworth nor Hampden-Smith, whether considered individually or in

combination, disclose, teach or suggest a semiconductor light-emitting apparatus having the structure recited in independent claim 11.

Claims 14-17 and 19 depend from independent claim 11 and are patentable by virtue of their dependence on independent claim 11, in addition to their recitation of additional patentable subject matter.

Withdrawal of the rejection of dependent claims 14-17 and 19 is respectfully requested.

Claims 21, 25-27, 32, 34 and 37 were rejected under 35 U.S.C. §103 (a) over Soules or Soules and Shimoyama in view of Thompson et al. (U.S. Patent No. 6,166,489; hereafter "Thompson"). With respect to claim 37, the rejection is moot due to the cancellation of that claim. With respect to claims, 21, 25-27, 32 and 34, the rejection is respectfully traversed.

Independent claim 21 recites a GaN semiconductor light-emitting device that comprises a substrate, a light-emitting layer configured to emit light, and a reflection layer configured to reflect light toward a light extracting direction, wherein the light-emitting layer and the reflecting layer are positioned so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

Thompson, in contrast, teaches light-emitting devices having a pixel comprising a first light emitting stack and a second light emitting stack placed side by side. Thompson does not teach a GaN semiconductor light-emitting device, as recited in claim 21.

For at least the reasons set forth above with respect to independent claim 21, neither Soules, Shimoyama nor Thompson, whether considered individually or in combination, disclose, teach or suggest a semiconductor light-emitting apparatus having the structure recited in independent claim 21. Therefore, Thompson does not remedy the deficiencies of Soules and Soules and Shimoyama with respect to independent claim 21.

Claims 25-27, 32 and 34 depend from independent claim 21 and are patentable by virtue of their dependence on independent claim 21, in addition to their recitation of additional patentable subject matter.

Withdrawal of the rejection of independent claim 21 (and its dependent claims 25-27, 32 and 34) is respectfully requested.

Claims 22, 28-31 and 33 were rejected under 35 U.S.C. §103 (a) over Soules and Thompson or Soules, Shimoyama and Thompson in view of Butterworth. The rejection is respectfully traversed.

For at least the reasons set forth above with respect to independent claim 21, neither Soules, Shimoyama, Butterworth nor Thompson, whether considered individually or in combination, disclose, teach or suggest a semiconductor light-emitting apparatus having the structure recited in independent claim 21.

Claims 22, 28-31 and 33 depend from independent claim 21 and are patentable by virtue of their dependence on independent claim 21, in addition to their recitation of additional patentable subject matter.

Withdrawal of the rejection of dependent claims 22, 28-31 and 33 is respectfully requested.

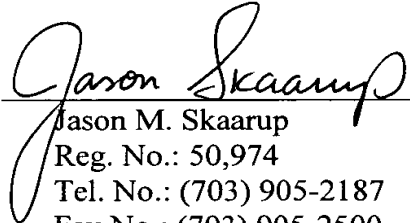
For the foregoing reasons, Applicants respectfully submit that claims define patentable subject matter and that the entire application is in condition for allowance. Timely notice to that effect is therefore respectfully requested.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached Appendix is captioned **"Version with markings to show changes made"**.

Respectfully submitted,
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JPD/JMS

Attachments:

Appendix
Drawing Change Authorization Request
Amended Figure 7
Copy of September 1, 2000 date-stamped post card receipt
First two pages of priority documents

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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE DRAWINGS:

Please see the attached Drawing Change Authorization Request.

IN THE SPECIFICATION:

The specification is changed as follows.

Page 3, delete the whole paragraph starting in line 14 and replace it with the following new paragraph.

Moreover, according to the inventors' investigation, it has been found that a [red] green component of light emitted from a fluorescent material becomes rich when ZnS:Eu, YVO₄:Ce or Y₂O₂S:Ce is used as the fluorescent material.

Page 6, delete the whole paragraph starting in line 6 and replace it with the following new paragraph.

Among the aforementioned fluorescent materials, ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce exhibit longer emission wavelengths than the other fluorescent materials when excited by light in a wavelength range of from blue to green. That is, the color of light emitted from ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce is [redder] greener, so that mixture light of the light emitted from these fluorescent materials and the light emitted from the primary light source becomes whiter. Hence, at least one member selected from the group consisting of ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce is preferably used as the fluorescent material in order to obtain whiter emission light.

Page 14, delete the whole paragraph starting in line 4 and replace it with the following new paragraph.

The first fluorescent material contained in the secondary light source can emit green light when excited by blue light. Preferably, the fluorescent material is composed of at least one member selected from the group consisting of ZnS:Cu, Au, Al; ZnS:Cu, Al; ZnS:Cu; ZnS:Mn; ZnS:Eu; YVO₄:Eu; YVO₄:Ce; Y₂O₂S:Eu; and Y₂O₂S:Ce. Each [of these]

fluorescent [materials] material including ZnS:Cu, Au, Al; ZnS:Cu, Al; ZnS:Cu; ZnS:Eu; YVO₄:Ce; and Y₂O₂S:Ce has an absorption spectrum to blue light (from blue to blue-green) and emits green light with a wavelength longer than the excitation wavelength, whereas at least the fluorescent materials of ZnS:Mn; YVO₄:Eu; YVO₄:Ce; and Y₂O₂S:Eu emit red light.

green

IN THE CLAIMS:

Please cancel claim 37 without prejudice or disclaimer.

Please amend claims 1, 11, 21, 22, 23 and 35 as follows.

1. (Twice Amended) A light-emitting apparatus comprising:
 - a primary light source including a GaN semiconductor light-emitting device with an emission wavelength of from 380 nm to 500 nm; [and]
 - a secondary light source including a fluorescent material; and
 - a third light source configured to emit red light,wherein said secondary light source emits light based on light given from said primary light source so that light of said secondary light source and the light of said primary light source are mixed together to thereby generate light different in luminescent color from the light emitted from said primary light source, and
 - wherein the GaN semiconductor light-emitting device comprises:
 - a substrate;
 - a light-emitting layer configured to emit light and positioned a first distance from the substrate; and
 - a reflection layer [positioned closer to the substrate than the light-emitting layer and being] configured to reflect light toward a light extracting direction and being positioned a second distance from the substrate, wherein the second distance is less than the first distance so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

11. (Twice Amended) A light-emitting apparatus comprising:
 - a primary light source including a GaN semiconductor light-emitting device with an emission wavelength of from 420 nm to 490 nm;
 - a secondary light source including a first fluorescent material composed of at least one member selected from the group consisting of ZnS:Eu, YVO₄:Ce and Y₂O₂S:Ce; and

a third light source including a second fluorescent material configured to absorb the light of said primary light source, the third light source being configured to emit red light,

wherein said secondary light source emits light based on light given from said primary light source so that light of said secondary light source and the light of said primary light source are mixed together to thereby generate light different in luminescent color from the light emitted from said primary light source, and

wherein the GaN semiconductor light-emitting device comprises:

a substrate;

a light-emitting layer configured to emit light and positioned a first distance from the substrate; and

a reflection layer configured to reflect light toward a light extracting direction and being positioned a second distance from the substrate, wherein the second distance is less than the first distance so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

21. (Twice Amended) A light-emitting apparatus comprising:

a first light source including a GaN semiconductor light-emitting device configured to emit blue light;

a second light source including a first fluorescent material configured to absorb light of said [primary] first light source and to emit green light; and

a third light source comprising a red color LED configured to emit red light;

wherein the light of said first light source, light of said second light source and light of said third light source are mixed together to thereby generate white light, and

wherein the GaN semiconductor light-emitting device comprises:

a substrate;

a light-emitting layer configured to emit light and positioned a first distance from the substrate; and

a reflection layer configured to reflect light toward a light extracting direction and being positioned a second distance from the substrate, wherein the second distance is less than the first distance so that the reflection layer is positioned closer to the substrate than the light-emitting layer.

22. (Twice Amended) A light-emitting apparatus according to claim 21, wherein said first fluorescent material is composed of at least one member selected from the group consisting of ZnS:Cu, Au, [Al] Al; ZnS:Cu; [ZnS:Mn;] ZnS:Eu; YVO₄:Ce; [Y₂O₂S:Eu] and Y₂O₂S:Ce.

23. (Amended) A light-emitting apparatus [according to claim 21,] comprising:
a first light source including a GaN semiconductor light-emitting device configured to
emit blue light;

a second light source including a first fluorescent material configured to absorb light
of said primary light source and configured to emit green light; and

[wherein said] a third light source [includes] including a second fluorescent material
configured to absorb light of said first light source and configured to emit red light,

wherein light of said first light source, light of said second light source and light of
said third light source are mixed together to thereby generate white light.

35. (Amended) A light-emitting apparatus [according to claim 11] comprising:
a primary light source including a GaN semiconductor light-emitting device with an
emission wavelength of from 420 nm to 490 nm;

a secondary light source including a first fluorescent material [wherein said first
fluorescent material is] composed of at least one member selected from the group consisting
of ZnS:Cu; Au, Al; ZnS:Cu; ZnS:Mn; ZnS:Eu; YVO₄:Eu; YVO₄:Ce; Y₂O₂S:Eu and
Y₂O₂S:Ce; and

a third light source including a second fluorescent material configured to absorb the
light of said primary light source, the third light source being configured to emit red light,

wherein said secondary light source emits light based on light given from said primary
light source so that light of said secondary light source and the light of said primary light
source are mixed together to thereby generate light different in luminescent color from the
light emitted from said primary light source.

日 本 国 特 許 庁
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This is to certify that the annexed is a true copy of the following application as filed
in this Office.

願 年 月 日
Date of Application:

1 9 9 9 年 1 2 月 1 7 日

願 番 号
Application Number:

平成 1 1 年 特 許 願 第 3 5 9 9 2 0 号

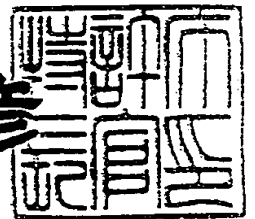
願 人
Applicant(s):

豊田合成株式会社

2 0 0 0 年 6 月 2 9 日

特 許 庁 長 官
Commissioner,
Patent Office

近 藤 隆 彦



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This is to certify that the annexed is a true copy of the following application as filed
this Office.

願 年 月 日
Date of Application:

1999年 9月 2日

願 番 号
Application Number:

平成11年特許願第249350号

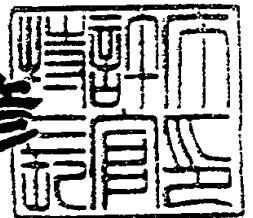
願 人
Applicant(s):

豊田合成株式会社

2000年 6月29日

特許庁長官
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Patent Office

近 藤 隆 彦



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